# ILEX IN TAIWAN AND THE LIUKIU ISLANDS

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## INTRODUCTION

IN PREPARING A FLORA OF OKINAWA, Dr. E. H. Walker, Associate Curator, Department of Botany, Smithsonian Institution, asked me to comment on the portion of his manuscript devoted to *Ilex*. Although in my studies of the Chinese species of that genus I included some Taiwan forms, chiefly those occurring on both the island and the mainland of China, my study of the insular material was not exhaustive. As I possessed even less knowledge of the Liukiu Islands species I scarcely felt competent to accept his invitation. Yet my knowledge of the Chinese species of *Ilex* enabled me to assure him that the two Chinese species included in his manuscript do not occur in the Liukiu Islands. As to the other species I was uncertain and requested him to send me as much Okinawan material as possible. In the identification of these specimens I was naturally forced to consider all the known species of Taiwan and the Liukiu Islands. The results of this study are included in this paper.

This paper is supplementary in nature to my publications on THE GENUS ILEX IN CHINA.[1] Descriptions, synonyms, and the citations of literature and specimens relating to the species treated therein are not repeated here; however, references to that former work have been included. The specimens marked US are deposited in the United States National Herbarium, and those marked G are in the Gray Herbarium. All other cited specimens, whether designated by A or not, are in the Herbarium of the Arnold Arboretum.

Through Professor E. D. Merrill I have been able to obtain photographs and fragments of types from Dr. Siro Kitamura, Director of the Botanical Institute, Kyoto University, Kyoto, Japan, and Dr. H. Hara of the Botanical Institute, Tokyo University, Tokyo, Japan. To both of these men and to the Curators of the above-mentioned institutions I should like to express my deep appreciation for their help in clarifying certain nomenclatural problems in my study of the *Ilex* of Taiwan and the Liukiu Islands.

## PHYTOGEOGRAPHICAL SIGNIFICANCES

The geographic distribution of the Taiwan and Liukiu Islands species of *Ilex* reflects the floristic relationships of the areas covered, and to a certain extent it also illustrates the affinity of the floras of these islands to those of the Chinese mainland and Japan, as well as that of the Philippine Islands.

[1] Journal of the Arnold Arboretum **30**: 233–344, 348–387, 1949; **31**: 39–80, 214–240, and 241–263, 1950.

In Taiwan twenty-two valid species occur. Twelve of these occur also on the Chinese mainland. Six of the twelve are confined to China and Taiwan, while four, *I. goshiensis* Hayata, *I. micrococca* Maxim., *I. pedunculosa* Miq., and *I. rotunda* Thunb., are widely spread in China, occurring also in Japan and, in some cases, in Korea or Indo-China. Two other species, *I. asprella* (Hook. & Arn.) Champ. and *I. formosana* Maxim., occur also in the Philippines. Among the species confined to Taiwan and China (and closely adjacent regions), two, *I. bioritsensis* Hayata and *I. yunnanensis* Franch., are restricted to the higher altitudes of western China and central Taiwan, and the others, *I. cochinchinensis* Lour., *I. ficoidea* Hemsl., *I. pubescens* Hook & Arn., and *I. triflora* Blume var. *kanehirai* (Yamamoto) S. Y. Hu, are subtropical species which occur in the coastal provinces on the mainland and in the southern part of Taiwan. Some of these also occur in Hainan and in northern Indo-China. It is worthy of note that, although there are four widely spread species that Taiwan shares with Japan and China, there is only a single taxon, *Ilex sugeroki* Maxim. var. *brevipedunculata* (Maxim.) S. Y. Hu, that is confined to Taiwan and Japan. There is no species that is confined to Taiwan and the Philippines. It is also interesting to note that six species, *I. buergeri* Miq., *I. chinensis* Sims, *I. crenata* Thunb., *I. latifolia* Thunb., *I. macropoda* Miq., and *I. serrata* Thunb., which are common in Japan and eastern China, have not been found in either Taiwan or the Liukiu Islands.

Thus for the *Ilex* species of Taiwan, approximately 54% are Chinese elements, 23% are endemic, 18% are shared with the flora of the Liukius, and a very minor percentage are Japanese elements. The genus is strongly marked and easily recognizable and comprises an extraordinary number of distinct species, both deciduous and evergreen. They are in general very specific in their association with different types of vegetation. For example, *I. bioritsensis* Hayata is associated with plants constituting the broad-leaved forests of the secondary order, while *I. yunnanensis* Franch. var. *parvifolia* (Hayata) S. Y. Hu is found only along the edge of the coniferous forests. Due to this fact certain species can be used to a considerable extent as indicators of the type of vegetation in their native habitats. Therefore it may perhaps be a legitimate assumption that the proportion of Chinese, Japanese, and endemic elements existing in the *Ilex* flora of Taiwan is likely to prevail in other genera. As illustrated by the species of *Ilex*, the Taiwan flora is strongly affiliated with that of the China mainland, while the affinity between the flora of Taiwan and that of Japan is weak. The chief Philippine Islands elements are not found in Taiwan proper at all, but are limited to Botel Tobago.

There are twelve valid species of *Ilex* in the Liukiu Islands, four of which are endemic. Four species are limited to Taiwan and the southern Liukiu Islands, and one occurs only in Japan and the northern Liukiu Islands. *Ilex goshiensis* Hayata has a range extending from the Liukius and Taiwan north to Japan and south to Hainan Island. There is also in the Liukiu group one widely spread Chinese subtropical element, *I. ficoidea* Hemsl., and another widely spread Sino-Japanese species, *I. rotunda* Thunb.

If the genus *Ilex* may be taken as a criterion, the flora of the Liukiu Islands is characterized by a rather high degree of endemism.

Binomials like *Ilex mertensii* Maxim. and *Ilex matanoana* Makino, which are species endemic to the Bonin Islands, appear repeatedly in literature concerning the floras of Taiwan and the Liukiu Islands. As a matter of fact, however, the Bonin Islands species are morphologically very different, and their affinities with the plants of the group of small islands extending southward toward the Micronesias and the Caroline Islands seem to be closer than with the plants of Taiwan and the Liukiu Islands. At least it appears to me that none of the Taiwan and Liukiu material should carry the names applied to the species of the Bonin Islands.

## KEY TO SUBGENERA, SECTIONS, AND SPECIES

A. Leaves deciduous, branchlets with abbreviated shoots, each bearing a fascicle of leaves and flowers; lenticels conspicuous on the current year's growth. . . . . Subgen. PRINOS.

B. Inflorescence a trichotomously branched cyme bearing 15 or more flowers; fruit small, with smooth pyrenes, each longitudinally canaliculate on the back. . . . . Sect. **Micrococca.**
1. *I. micrococca.*

BB. Inflorescence a solitary flower or a simple 3-flowered cyme, often fasciculated with the leaves at the end of an abbreviated shoot; fruit medium-sized, with striate and sulcate pyrenes; endocarp woody or stony. . . . . Sect. **Prinoides.**

C. Leaves ovate, entirely glabrous, obtuse or shortly and broadly acuminate at the apex; ovary with no evident style; pyrenes woody, striate. . . . . 2. *I. kusanoi.*

CC. Leaves ovate-elliptic, hirsute on the nerves above, acuminate, the acumen up to 12 mm. long; style evident; pyrenes stony, striate and deeply sulcate. . . . . 3. *I. asprella.*

AA. Leaves evergreen; branchlets without abbreviated leafy shoots; lenticels usually absent on the current year's growth. . . . . Subgen. EUILEX.

B. Pistillate and staminate inflorescences both solitary in the axils of leaves on the current year's growth; pyrenes smooth, with coriaceous or sublignescent endocarps, slightly concave, unicanaliculate or 3-striate and 2-sulcate on the back. . . . . Sect. **Lioprinus.**

C. Inflorescence cymose; pyrenes concave or unicanaliculate at the back.

D. Fruit ovoid-globose, 5–7 mm. in diameter; pyrenes 4–5 mm. long, dorsally concave; pedicels slender; leaves pubescent on both surfaces (except var. *hakkuensis*). . . . . 4. *I. lonicerifolia.*

DD. Fruit ellipsoid, 8–10 mm. in diameter; pyrenes 8 mm. long, deeply unicanaliculate on the back; pedicels stout; leaves glabrous. . . . . 5. *I. matudai.*

CC. Inflorescence umbelliform; pyrenes 3-striate and 2-sulcate at the back; leaves entire. . . . . 6. *I. rotunda.*

CCC. Inflorescence subcapitate; the pyrenes smooth, slightly concave on the back; the fruit ellipsoid-globose, 5–7 mm. in diameter. . . . . 7. *I. tugitakayamensis.*

BB. Pistillate flowers solitary, axillary in the scales or leaves on the current year's growth, very rarely fasciculate; staminate flowers fasciculate on the second year's growth, rarely solitary and axillary in the scales or leaves at the base of current year's growth; pyrenes smooth or slightly roughened; the endocarp coriaceous. . . . . Sect. **Paltoria.**

C. Leaves not punctate beneath.

D. Petioles 8–17 mm. long, up to one third the length of the lamina; leaves usually entire, rarely serrate, the midribs plane or slightly impressed above. . . . . 8. *I. pedunculosa.*

DD. Petioles 2–7 mm. long, up to one seventh the length of the lamina; leaves usually serrate, the midrib elevated and pubescent above.

E. Pyrenes 4; branchlets thickly ferruginous-pubescent; leaves aristately serrate, extending almost to the base. . . . . 9. *I. yunnanensis* var. *parvifolia.*

EE. Pyrenes 4, 5, or 6; branchlets puberulous; leaves serrate or crenate only near the apex, the basal half entire. . . . . 10. *I. sugeroki* var. *brevipedunculata.*

CC. Leaves punctate beneath.

D. Pistillate flowers and fruit solitary; leaves elliptic or oblanceolate, apex acute or shortly acuminate.

E. Leaves elliptic, the apex acute; petioles 7–10 mm. long; ca. one third the length of the lamina. . . . . 11. *I. maximowicziana.*

EE. Leaves oblanceolate; broadly acuminate; petioles 3–6 mm. long, ca. one eighth the length of the lamina. . . . . 12. *I. mutchagara.*

DD. Pistillate flowers and fruit fasciculate; leaves obovate or oblong, the apex rounded. . . . 13. *Ilex triflora* var. *kanehirai.*

BBB. Pistillate and staminate inflorescences both fasciculate, axillary on the second year's growth; pyrenes rugose, pitted or striate with elevated striae; endocarp woody or stony.

C. Pyrenes 4 or 2; endocarp woody or stony; individual branches of the inflorescence uniflorous. . . . . Sect. **Aquifolium.**

D. Leaves entire or spiny margined.

E. Fruit large, 9–12 mm. in diameter; pyrenes stony, irregularly wrinkled and pitted; leaves entire, acuminate, (4–) 6–7 (–8) cm. long.

F. Fruiting pedicels 4–9 mm. long. . . . . 14. *I. integra.*

FF. Fruiting pedicels 1–3 mm. long. . 15. *I. brachypoda.*

EE. Fruit small, 4–8 mm. in diameter; pyrenes striate and sulcate; leaves rigid, spiny, when entire rounded at the apex or rarely short acuminate, 1–4 cm. long.

F. Leaves ovate or quadrangular, those on the fruiting branchlets with 2 or 3 strong spines on each side; fruiting pedicels 2 mm. long; pyrenes 2. . . . . 16. *I. bioritsensis.*

FF. Leaves obovate or elliptic; entire or dimorphous; fruiting pedicels 4–5 mm. long; pyrenes 4.

G. Leaves dimorphous, those on the fruiting branchlets entire and those on the sprouts sinuate and

spiny, the entire ones obovate, rounded at the apex. ..... 17. *I. dimorphophylla.*

GG. Leaves entire, elliptic, obtuse or shortly acuminate at the apex. ..... 18. *I. suzukii.*

DD. Leaves serrate or crenate.

E. Fruiting pedicels 2–3 mm. long.

F. Petioles 4–9 mm. long, 12–22 times shorter than the length of the lamina. ..... 19. *I. formosana.*

FF. Petioles 8–16 mm. long, 5–12 times shorter than the lamina. ..... 20. *I. ficoidea.*

EE. Fruiting pedicels (4–) 6–8 (–14) mm. long.

F. Leaves obovate, rarely elliptic, obtuse, rounded, retuse, rarely broadly and shortly acuminate at the apex; fruiting pedicels 9–14 mm. long. . 21. *I. liukiuensis.*

FF. Leaves oblong-elliptic, elliptic or obovate-elliptic, apex acuminate; fruiting pedicels (4–) 6–8 mm. long.

G. Fruit 10–11 mm. in diameter; leaves shortly and abruptly acuminate, the lateral nerves prominent on both surfaces. ..... 22. *I. uraiensis.*

GG. Fruit 5–6 mm. in diameter; leaves caudate, the lateral nerves obscure on both surfaces. ..... 23. *I. warburgii.*

CC. Pyrenes 4, 5, or 6, the endocarp coriaceous or sublignescent; individual branches of the fascicles of the staminate plant usually cymose or umbelliform. ..... Sect. **Pseudoaquifolium.**

D. Branchlets ridged, in cross-section appearing quadrangular; pyrenes 6, 3-striate and 2-sulcate, the endocarp sublignescent; leaves chartaceous or membranaceous, serrate or subentire, pubescent on both surfaces. ..... 24. *I. pubescens.*

DD. Branchlets subterete; pyrenes 4 or 5, smooth, the endocarp coriaceous; leaves entire, coriaceous, glabrous.

E. Leaves 9–16 cm. long, punctate beneath; fruit with a columnar-mammiform stigma; pyrenes smooth. ..... 25. *I. cochinchinensis.*

EE. Leaves 2–5 cm. long, epunctate, fruit with a capitate or discoid stigma; pyrenes 3-striate.

F. Leaves suborbicular or broad-elliptic, the apex shortly produced, usually retuse; individual branches of the inflorescence 1- or 3-flowered. .... 26. *I. goshiensis.*

FF. Leaves ovate-elliptic or elliptic, acuminate; individual branches of the inflorescence uniflorous. ..... 27. *I. hayataiana.*

1. **Ilex micrococca** Maxim. in Mém. Acad. Sci. St. Pétersb. VII. **29** (3): 39, *pl. 1, fig. 6.* 1881. — S. Y. Hu in Jour. Arnold Arb. **30**: 261. 1949.

*Ilex micrococca* var. *longifolia* Hayata, Ic. Pl. Form. **3**: 55, *pl. 9.* 1913, et Ic. Pl. Form. **6** (Suppl.): 13. (Gen. Ind. Fl. Form. 13). 1917. — Ito, Taiwan Shokub. Zus. *fig. 488.* 1928. — Sasaki, Cat. Gov. Herb. 317. 1930. — Suzuki in Masamune, Short Fl. Form. 125. 1936.

Hayata differentiated his variety by the "much narrower leaves with acute or obtuse base which is never rounded as is the case with the type."

The base of the leaf in this species varies according to the position of the leaf on the branchlet. The leaves on the lower part of the branchlet have a broader base, which appears rounded, and those on the apical portions have a narrower base which is obtuse or acute. Such variations occur on specimens collected in Japan and China as well as on those from Taiwan. Moreover, the Taiwan specimens that I have examined appear to be identical with Hayata's type (photograph) of this variety, *N. Konishi*, Aug. 1906, from Uraisha. All these specimens agree with the Chinese and Japanese material in the size, texture, and margin of the leaves, in the inflorescence, and in the characters relating to the fruit and pyrenes. I see no reason for maintaining this Taiwan variety.

In Taiwan, *Ilex micrococca* occurs only in the northern and west-central parts of the island. It has been recorded from Sozan, Toyen, Uraisha, the mountains Daiton, Taihei and Gosi, and Lake Jitugetutan. It is a common tree in the woods, growing to a considerable height (up to 23 meters). In the whole family there is no species that equals *I. micrococca* in the length of its fruiting peduncles and in the large number of fruits in each infructescence. For this reason, this species is well worthy of introduction into southern American gardens for the fruiting branches.

The chartaceous leaves, the conspicuous lenticels on the current year's growth, and the occasional occurrence of abbreviated shoots in this species suggests its relationship with *I. macrocarpa* Oliv., a deciduous species. Of all the specimens that I have examined, I have not seen any with leaves on the second year's growth. For this reason I have placed the species in the subgenus *Prinos*. Field data for the winter habit of the species are needed. When such data are available, it may prove necessary to change the subgeneric status of this species.

2. **Ilex kusanoi** Hayata in Jour. Coll. Sci. Tokyo **30**: 55 (Mat. Fl. Form. 55). 1911; Ic. Pl. Form. **1**: 132. 1911, et **6** (Suppl.): 13 (Gen. Ind. Fl. Form. 13). 1917. — Kanehira, Form. Trees 123. 1917, rev. ed. 375, *fig. 331*. 1936. — Sasaki in Trans. Nat. Hist. Soc. Form. **18**: 330, 1928, et Cat. Gov. Herb. 317. 1930. — Suzuki in Masamune, Short Fl. Form. 125. 1936. — Sonohara et al., Fl. Okinawa 92. 1952.

*Ilex taiwaniana* Hayata in Jour. Coll. Sci. Univ. Tokyo **30**: 58 (Mat. Fl. Form. 58). 1911; Ic. Pl. Form. **1**: 135. 1911, et **6** (Suppl.): 13 (Gen. Ind. Fl. Form. 13). 1917. — Kanehira, Form. Trees 127. 1917.

*Ilex poneantha* Koidzumi, Pl. Nov. Amami-Ohsim. 13. 1928, syn. nov.

Deciduous tree (?), entirely glabrous, with both elongated and abbreviated shoots; second year's growth of the elongated shoot 3–5 mm. in diameter, when dry castaneous, shiny, with conspicuous lenticels, the current year's growth subterete, up to 20 cm. long, 2 mm. in diameter; abbreviated shoots 1 cm. long, 2.5 mm. in diameter, rugose with leaf-scars and scars of the pedicels, bearing 1–4 leaves, 3–13 flowers. Leaves 6–15 mm. apart on elongated shoots, fasciculate at the end of abbreviated shoots; stipules minute, broadly deltoid; petioles 5–8, rarely up to 10 mm. long,

one tenth up to one sixth the length of the lamina, the distal portion winged with decurrent leaf-base, canaliculate above; lamina chartaceous, olivaceous, ovate, 4–6.5 cm. long, 2.5–4 cm. wide, acute at the base, obtuse or shortly broad-acuminate at the apex, remotely crenulate-serrate, the midrib slightly impressed above, prominent beneath, the lateral nerves 5–7 pairs, obscure above, evident beneath, with reticulation obvious beneath. Inflorescence fasciculate, in the axils of scales or small leaves at the base of the elongated shoots or at the apex of the abbreviated ones. Staminate flowers solitary or in a simple 3-flowered cyme, peduncles 3 mm. long, pedicels 3–4 mm. long, prophyllus basal, ciliate; calyx patelliform, 4- up to 6-lobed, the lobes ovate, erose, ciliate; corolla 10 mm. across, the petals oblong, 4 mm. long, 2.5 mm. wide, connate at the base; stamens shorter than the petals, the anthers oblong; rudimentary ovary pulvinate, depressed at the center. Pistillate flowers 3 in each fascicle, the pedicels 12–17 mm. long; calyx patelliform, 2.5 mm. across, with 5 or 6 lobes, the lobes rounded and ciliate; corolla rotate, 5 mm. across, connate at the base, the lobes ovate, 2 mm. long, 1.5 mm. wide; staminodes two thirds the length of the corolla, the sterile anthers sagittate; ovary globose, 1 mm. in diameter, the stigma mammiform. Fruit not seen.

TAIWAN: Taito, *S. Kusano 8*, July 1908 (photograph of the TYPE); Kashioto [Kwasyoto], *G. Nakahara 1025* (photograph of TYPE of *Ilex taiwaniana* Hayata). BOTEL TOBAGO: Kotosyo [Kotosho], *S. Sasaki*, Feb. 7, 1920.

LIUKIU ISLANDS: Amami-Oshima, *J. Ohba 171* (LECTOTYPE of *Ilex poneantha* Koidz., photograph and fragments).

*Ilex kusanoi* Hayata is closely related to *Ilex macropoda* Miq., but the latter species has relatively longer petioles, puberulent leaves, solitary pistillate flowers with the pedicels 6–7 mm. long, and uniflorous individual staminate flowers in small fascicles. Hayata distinguished this species from his *I. taiwaniana* by its "much thinner" leaves, but in his descriptions for both species he used the same term, "chartaceo-mebranacea." As the types of these two binomials were collected at different seasons, there may be a reason for the difference in the texture of the leaves. The fragment of the type of *Ilex poneantha* Koidz., kindly supplied by Dr. S. Kitamura of Kyoto, Japan, represents a staminate plant of *Ilex kusanoi* Hayata.

3. **Ilex asprella** (Hook & Arn.) Champ. ex Benth. in Hook Jour. Bot. Kew Gard. Misc. **4**: 329. 1852. — Henry in Trans. As. Soc. Jap. **24** (Suppl.): 26 (List Pl. Form. 26). 1896. — Mat. & Hayata, Enum. Pl. Form. 81. 1906. — Ito, Taiwan Shokub. Zus. *fig. 486*. 1928. — Sasaki, Cat. Gov. Herb. 316. 1930. — Suzuki in Masamune, Short Fl. Form. 124. 1936. — S. Y. Hu in Jour. Arnold Arb. **30**: 269. 1949.

TAIWAN: Taipei, *H. Keng 1024*.

This species is widely distributed in the warm temperate, subtropical, and tropical regions on the mainland of China and on Taiwan, and extends southward to northern Luzon in the Philippines. In Taiwan it has been

reported from the mountains Daiton, Gosizan and Sozan, and from Toyen of Taihoku prefecture in the north, Nanto of Taichu prefecture in the west, Karenko [Kwarenko] and Taito of the east coast, South Cape at the southern extremity, and Mt. Niitaka in the center of the island. It is a common shrub about three meters high with a trunk up to 6 cm. in diameter, occurring in thickets and along roadsides from sea level up to 1000 meters altitude. Its white flowers appear in early March or April. The fasciculate staminate flowers, the solitary long-pedicellate pistillate flower, the globose fruit with evident style and capitate stigma, and the striate pyrenes suggest close relationship with *Ilex longipes* Chapm. of southeastern North America, which ranges from Florida to Alabama and Tennessee. These species of *Ilex* provide another proof of the affinities of the floras of eastern Asia and eastern North America.

4. **Ilex lonicerifolia** Hayata, Icon. Pl. Form. 3: 54, *pl. 8*. 1913, et 6 (Suppl.): 13 (Gen. Ind. Fl. Form. 13). 1917. — Sasaki, Cat. Gov. Herb. 317. 1930. — Suzuki in Masamune, Short Fl. Form. 125. 1936. — S. Y. Hu in Jour. Arnold Arb. 30: 290. 1949.

The range of this species is limited to a narrow band across the center of Taiwan, Lat. 23° 50′–24° 20′ N. The type material was collected from Pokupokusha, Kwarenko, on the east coast. Additional specimens have been collected from Mt. Daisetu and from Nanto and Lake Candidius (Jitugetutan) of Taichu prefecture, at an altitude of 750 meters. The plant has been reported as a tree up to 17 meters high. It flowers in May. The mature fruits are red. It can be readily recognized by its pubescent entire leaves, cymose inflorescences, medium-sized ovoid-globose fruits, and smooth pyrenes which are shallowly concave on the back.

4a. **Ilex lonicerifolia** var. **hakkuensis** (Yamamoto) S. Y. Hu in Jour. Arnold Arb. 30: 291. 1949.

*Ilex hakkuensis* Yamamoto Suppl. Ic. Pl. Form. 1: 32, *fig. 14*. 1925. — Sasaki, Cat. Gov. Herb. 316. 1930. — Suzuki in Masamune, Short Fl. Form. 125. 1936.

This glabrous variety was first collected at Hakku by B. Hayata in April 1916. Material of this variety has also been collected from Rengeti and Lake Jitugetutan of Taichu prefecture.

5. **Ilex matsudai** Yamamoto Suppl. Ic. Pl. Form. 1: 37, *fig. 17*. 1925. — Sasaki, Cat. Gov. Herb. 317. 1930. — Kanehira, Form. Trees 377, *fig. 333*. 1936.

*Ilex lonicerifolia* Hayata var. *matsudai* Yamamoto in Jour. Trop. Agr. 5: 55. 1933. Syn. nov.

An evergreen tree, entirely glabrous; the third and second years' growth 3–4 mm. in diameter, more or less rugose with numerous conspicuous lenticels, the current year's growth 2 mm. in diameter, longitudinally

striate, the terminal buds ovoid, with glabrous and ciliate scales. Leaves occurring even on the third year's growth, 1–2 cm. apart, the stipules obscure; petioles 8–15 mm. long, rugose, canaliculate above; lamina subcoriaceous, olivaceous and brown, slightly shiny above, opaque beneath, oblong-elliptic, the lower ones often broad-elliptic or suborbicular, 4–9.5 cm. long, 2.5–4 cm. wide, acute or rarely obtuse at the base, very shortly broad-acuminate, rarely obtuse at the apex, the acumen 3–5 mm. long, almost as wide; margin entire, more or less recurved when dry; midrib plane above, elevated beneath, the principal lateral nerves 9–11 pairs, obscure above, elevated beneath, reticulate near the margin. Flowers not known. Infructescence cymose, solitary, in the axils of the leaves on the current year's growth, with 3 fruits, the peduncles 3–11 mm. long, dorsoventrally compressed, glabrous; pedicels 5 mm. long, very minutely puberulent at the base. Fruit ellipsoid, 8–10 mm. long, 6–8 mm. in diameter, the persistent calyx explanate, 4 mm. in diameter, with 5 or 6 rounded, ciliate lobes, the stigma discoid. Pyrenes 4 or 5, smooth, 8 mm. long, 2–5 mm. wide on the back, dorsally deeply and widely unicanaliculate, in cross-section U-shaped, the endocarp sublignescent.

TAIWAN: Koshun [Kosyun], Mt. Hiiran, *E. Matsuda* in 1919 (photo and fragment of TYPE); same locality, *K. Yamada 47*.

The evergreen entire leaves, the cymose infructescence, and the deeply unicanaliculate pyrenes of this species suggest a close relationship with *Ilex maclurei* Merr. of Kwangtung and northern Indo-China. Both of them are tropical species, but the latter can be distinguished by its large and thicker leaves and the compound cymose inflorescence.

6. **Ilex rotunda** Thunb., Fl. Jap. 77. 1784. — Henry in Trans. As. Soc. Jap. **24** (Suppl.): 27 (List Pl. Form 27). 1896. — Mat. & Hayata, Enum. Pl. Form. 82. 1906. — Sasaki, Cat. Gov. Herb. 318. 1930. — Ito, Taiwan Shokub. Zus. *fig. 487*. 1928. — Suzuki in Masamune, Short Fl. Form. 126. 1936. — S. Y. Hu in Jour. Arnold Arb. **30**: 308. 1949.

*Ilex koshunensis* Yamamoto, Suppl. Ic. Pl. Form. **1**: 36, *fig. 16*. 1925. — Suzuki in Masamune, Short Fl. Form. 125. 1936.

*Ilex sasakii* Yamamoto, op. cit. **1**: 39, *fig. 19*. 1925. — Sasaki, Cat. Gov. Herb. 318. 1930. — Suzuki, op. cit. 126. 1936.

TAIWAN: Toyen, Kayahara, *Hayata & Sasaki* (photograph of TYPE of *Ilex sasakii* Yamamoto); Koshun, Botansha, *Nakahara 941* (photograph of TYPE of *Ilex koshunensis* Yamamoto).

LIUKIU ISLANDS: Amami-Oshima, *Y. Hosoyamada*, July 29, 1927; without precise locality, *C. Wright 184* (G).

This is the most widely distributed species of *Ilex* in eastern Asia, ranging from Korea and Japan southward to the Liukiu Islands, Taiwan, and the mainland of China and Indo-China. In Taiwan it occurs on the mountains of Horan, Sitisei, and Taihei, and at Toyen, Sirin, and Sitiku of the

Taihoku prefecture, at Suwo of the Giran prefecture, Nanto, Mt. Noko, and Lake Candidius of the Taichu prefecture, Daibu of the Taito prefecture, and Koshun (Kosyun) of Tainan prefecture. It has been reported as a bush three meters high, as well as a tree of ten meters. The scarlet fruit matures in November.

The differences in the climatic and edaphic conditions prevailing in the large area covered by the wide range of the species naturally induce variations in the size, shape, and texture of the leaves. As to the Taiwan material, several binomials have been given to the various collections. As the types of these species are compared with a very large number of specimens from the extensive range of the species, many intergrades are noted. Thus with specimens from widely separated regions, the characters employed to separate Thunberg's from the more recently published species become insignificant and cease to be of value even for distinguishing varieties.

6a. **Ilex rotunda** Thunb. var. **microcarpa** (Lindl. ex Paxt.) S. Y. Hu in Jour. Arnold Arb. **30**: 310. 1949.

*Ilex microcarpa* Lindl. ex Paxt. in Fl. Gard. **1**: 43. 1850.

In Taiwan this variety occurs in the northern and west-central parts of the island. It differs from typical *Ilex rotunda* Thunb. in the puberulous inflorescence. The fruit of this variety is red. Masamune in 1935 described a yellow-fruited variety, *Ilex rotunda* Thunb. var. *sinensis* (Trans. Nat. Hist. Soc. Form **25**: 13) from Hongkong and Nanhoi district in Kwangtung province. As it also has puberulous inflorescences, its relationship is probably closer to this variety than to the typical *Ilex rotunda* Thunb. There is a possibility that Masamune may have observed immature fruits.

7. **Ilex tugitakayamensis** Sasaki in Trans. Nat. Hist. Soc. Form. **21**: 153, *fig. 3*. 1931. — Suzuki in Masamune, Short Fl. Form. 126. 1936. — S. Y. Hu in Jour. Arnold Arb. **30**: 288. 1949.

This unique species with its subcapitate umbelliform infructescence is known only from the type collection. It grows on Mt. Tugitaka. It has a peculiar position in the classification of the units of the section to which it belongs. As the fruiting pedicels all originate from the enlarged end of the peduncle, the inflorescence is umbelliform, and the species should belong to the Series *Umbelliformes* (Loes.) S. Y. Hu. But species of that series all possess three striate and two sulcate pyrenes, while the pyrenes of this species are smooth, coriaceous, and flattened or slightly concave on the back. In this section such pyrenes are found only in representatives of the Series *Chinenses* S. Y. Hu. More material is needed for the clarification of the taxonomic position of this species. Its coriaceous entire leaves and the much reduced fruiting pedicels suggest a relationship with *Ilex lancilimba* Merr. of Hainan Island. Future students may find it desirable to segregate these species in a distinct series of the Section *Lioprinus* (Loes.) S. Y. Hu.

8. **Ilex pedunculosa** Miq. in Versl. Med. Kon. Akad. Wet. II, **2**: 83. 1868 [1866] (Repr. 19. 1866), et in Ann. Mus. Bot. Lugd.-Bat. **3**: 106. 1867. — S. Y. Hu in Jour. Arnold Arb. **30**: 334. 1949.

*Ilex morii* Yamamoto, Suppl. Ic. Pl. Form. **1**: 38, *fig. 18*. 1925. — Suzuki in Masamune, Short Fl. Form. 125. 1936.

*Ilex impressivena* Yamamoto, l.c. 34, *fig. 15*. 1925. — Sasaki, Cat. Gov. Herb. 317. 1930. — Suzuki, l.c.

TAIWAN: The Central Mountain Range, *U. Mori*, Dec. 1908 (photograph of TYPE of *I. morii* Yamamoto); Taichu, Nanto, Saramao, *E. Matsuda*, Aug. 11, 1919 (photograph of TYPE of *I. impressivena* Yamamoto).

Yamamoto published two species from central Taiwan. He distinguished *I. morii* from *I. pedunculosa* Miq. by its smaller leaves and *I. impressivena* by the impressed midribs of the leaves. These variations also occur in specimens collected in China and Japan. After a comparative study of the Taiwan, Chinese, and Japanese specimens, I can only conclude that the two Formosan forms are conspecific with Miquel's species. In Taiwan, the species occurs in the west-central part of the island. The white flowers appear in August.

8a. **Ilex pedunculosa** Miq. var. **taiwanensis** S. Y. Hu in Jour. Arnold Arb. **30**: 336. 1949.

This is a small-leaved form endemic to northern Taiwan. The small white flowers appear in July. The small size and the brunneous-nigrescent color of the dried leaves of this variety remind one of *Ilex sugeroki* Maxim. var. *brevipedunculata* (Maxim.) S. Y. Hu, but the latter has much shorter petioles.

9. **Ilex yunnanensis** Franch. var. **parvifolia** (Hayata) S. Y. Hu in Jour. Arnold Arb. **30**: 341. 1949.

*Ilex parvifolia* Hayata in Jour. Coll. Sci. Univ. Tokyo **30**: 57 (Mat. Fl. Form. 57). 1911; Ic. Pl. Form. **1**: 134, *fig. 19*. 1911, et **6** (Suppl.): 13 (Gen. Ind. Fl. Form. 13). 1917. — Sasaki, Cat. Gov. Herb. 318. 1930. — Suzuki in Masamune, Short Fl. Form. 125. 1936.

*Ilex transarisanensis* Hayata ex Kanehira, For. Trees 127. 1917.

This is a high mountain form. In Taiwan it occurs at altitudes of 2500–3300 meters in the central and southwestern parts of the island. It is common along the edges of the forests between Mt. Arisan and Mt. Niitaka. A compact shrub, 1.5–5 meters high, with shiny dark green foliage, it bears white flowers in June and bright red berries from November to February. It should be an excellent species for foundation plantings, low screens, or hedges.

10. **Ilex sugeroki** Maxim. var. **brevipedunculata** (Maxim.) S. Y. Hu in Jour. Arnold Arb. **30**: 343. 1949.

*Ilex sugeroki* Maxim. forma *brevipedunculata* Maxim. in Mém. Acad. Sci. St. Pétersb. VII, **29** (3): 36, *pl. 1, fig. d*. 1881.

*Ilex taisanensis* Hayata in Jour. Coll. Sci. Univ. Tokyo **30:** 57 (Mat. Fl. Form. 57). 1911; in Ic. Pl. Form. **1:** 134. 1911, et **6** (Suppl.): 13 (Gen. Ind. Fl. Form. 13). 1917. — Sasaki, Cat. Gov. Herb. 318. 1930. — Suzuki in Masamune, Short Fl. Form. 126. 1936.

This variety occurs on the northwestern slopes of the Central Mountain Range, at Hori and Bioritu [Byoritu]. The few specimens that I have examined do not have the characteristic olivaceous or brown shiny leaves of the dried Japanese material. This may be due to the technique used in their preparation.

11. **Ilex maximowicziana** Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78:** 339 (Monog. Aquif. **1:** 339). 1901. — Sonohara et al., Fl. Okinawa 92. 1952.

*Ilex crenata* sensu Ito & Matsum. in Jour. Coll. Sci. Tokyo **13:** 367 (Tent. Fl. Lutch. 367). 1900, non Thunb. 1784.

*Ilex crenata* Thunb. var. *scoriatum* Yamamoto, Suppl. Ic. Form. **1:** 31. 1925, non var. *scoriarum* W. W. Smith. 1917.

*Ilex scoriatulum* Koidzumi in Bot. Mag. Tokyo **43:** 389. 1929. — Sasaki, Cat. Gov. Herb. 318. 1930. — Kanehira, Form. Trees, rev. ed. 381, *fig. 338*. 1936 (*I. scoriatum*). — Suzuki in Masamune, Short Fl. Form. 126. 1936.

An evergreen tree 3 m. high with a trunk 4 cm. in diameter; branchlets longitudinally ridged, the third year's growth 3 mm. in diameter, the lenticels obscure, the current year's growth 1.5 mm. in diameter, subquadrangular, very minutely puberulous, the terminal buds usually well developed, subconic, puberulent. Leaves occurring also on the second year's growth, 3–10 mm. apart, the stipules aciculate, 0.7 mm. long, persistent; petioles 7–10 mm. long, one third or one fourth the length of the lamina, puberulous, deeply grooved above; lamina coriaceous, olivaceous, shiny above, opaque and punctate beneath, elliptic or broad-elliptic, 2–4.5 cm. long, 1.3–2.3 cm. wide (up to 8 cm. long and 3.4 cm. wide, according to Loesener), acute at both ends, rarely the lower ones obtuse or rounded at the apex; evenly crenulate-serrate at the margin; midrib impressed above, elevated beneath, the lateral nerves obscure on both surfaces. Staminate inflorescences fasciculate, the individual branches 1- or 3-flowered, the flowers white, 4-merous; the calyx patelliform, the corolla rotate, the stamens shorter than the petals, with oblong anthers, the rudimentary ovary subglobose, with a rostellate center. Pistillate inflorescence solitary in the axils of small leaves or scales on the lower portion of the current year's growth; pedicels 7 mm. long, the flowers not known. Fruit globose, 8 mm. in diameter, the persistent calyx 3.5 mm. in diameter, 4-lobed, the lobes rounded, ciliate; the stigma discoid. Pyrenes 4 in number, 5 mm. long, 4 mm. wide, the endocarp coriaceous, smooth, 5-striate, the striae impressed.

TAIWAN: Taito, Taririku-sya, *S. Sasaki* in May 1924 (photograph).

LIUKIU ISLANDS: Ishigaki, *J. L. Gressitt 608* (TOPOTYPE). Irumuti, *S. Kawagoe* on July 27, 1919.

*Ilex maximowicziana* was based on the collections of Warburg and Tashiro from Ishigaki. The species has been overlooked by botanists interested in the flora of Taiwan and the Liukiu Islands. In 1925 Yamamoto interpreted the collections of Soma, Matsuda, and Sasaki from Taiwan, and Tashiro's collection (type material for *Ilex maximowicziana* Loes.) from Liukiu as *Ilex crenata* Thunb. var. *scoriarum* (*scoriatum*) W. W. Smith. In 1929 Koidzumi, presumably on the basis of the same collections cited by Yamamoto, raised the variety to specific rank, and not realizing that there was an earlier valid name for the Liukiu plant, called it *Ilex scoriatulum*.

This species is very closely related to *Ilex viridis* Champ. ex Benth. The differences between them rest on very minute and technical characters. In *I. maximowicziana* the petioles are relatively longer, equalling one third or one fourth the length of the lamina, and the pyrenes are smooth with impressed striae, while in *Ilex viridis* the petioles are relatively shorter, being one thirteenth to one sixth the length of the lamina, and the pyrenes are rugose with slightly elevated striae. The insular taxon is not well known. More material from Taiwan and the Liukiu Islands may prove it to be conspecific with the mainland form. In Taiwan, this species occurs at the southern end of the island.

12. **Ilex mutchagara** Makino, in Bot. Mag. Tokyo 27: 75. 1913. — Sasaki, Cat. Gov. Herb. 318. 1930, pro parte. — Sonohara et al., Fl. Okinawa 92. 1952.

An evergreen shrub up to 3 m. high, glabrous, the branchlets subquadrangular, deeply grooved, the third year's growth 1.5–2 mm. in diameter, the lenticels lacking, the leaf-scars semicircular, very slightly elevated; current year's growth 1 mm. in diameter, the terminal buds weakly developed. Leaves occurring also on the second year's growth, 2–5 mm. apart; the stipules callose, deltoid, 0.5 mm. long; petioles 3–6 mm. long, up to one eighth the length of the lamina, deeply narrow-grooved above. Lamina subcoriaceous, olivaceous, shiny above, opaque and punctate beneath, oblanceolate or obovate-elliptic, (2–) 4–5 cm. long, 1–1.5 cm (rarely up to 1.8 cm.) wide, cuneate at the base, shortly and broadly acuminate or rarely rounded at the apex, the acumen obtuse at the tip, remotely crenulate-serrate on the anterior half; midrib impressed above, elevated beneath, the lateral nerves obscure on both surfaces. Staminate inflorescence fasciculate, the individual branches 3- or 1-flowered, the peduncles 3–7 mm. long, minutely puberulent, the pedicels 2–3.5 mm. long, subpuberulent, the flowers 4-merous; calyx patelliform, the lobes suborbicular, ciliate; corolla rotate, the petals broad-elliptic, the stamens with ellipsoid anthers; the rudimentary ovary minute. Pistillate flowers not known. Fruit solitary, in the axils of the bracts at the base of the current year's growth, the pedicels with 2 prophylla at the middle, the berries globose, 7–8 mm. in diameter, the persistent calyx explanate, 3 mm. across, the lobes rounded, sparsely ciliate, the stigma thickly discoid. Pyrenes 4, smooth, 5 mm. long, the endocarp coriaceous.

LIUKIU ISLANDS: Okinawa, Nago, *E. H. Wilson 8071.*

Makino based his description chiefly on material collected from Okinawa, principally from Nago. Wilson's collection appears to have come from the type locality. Makino also cited material from Kume and Iriomote. Specimens from these islands belonging to this species have not been available for my examination.

As Makino observed, this species is closely allied to *Ilex crenata* Thunb. The oblanceolate, loosely arranged leaves and glabrous branchlets are very distinct. It is endemic to the Liukiu Islands, where it is rare even at the type locality. Its white flowers appear in February.

13. **Ilex triflora** Blume var. **kanehirai** (Yamamoto) S. Y. Hu in Jour. Arnold Arb. **30**: 332. 1949.

*Ilex crenata* Thunb. var. *kanehirai* Yamamoto, Suppl. Ic. Pl. Form. **1**: 31, *fig. 11*. 1925.

*Ilex kanehirai* (Yamamoto) Koidz. in Bot. Mag. Tokyo **43**: 389. 1929. — Sasaki, Cat. Gov. Herb. 317. 1930. — Kanehira, Form. Trees, rev. ed. 375. 1936. — Suzuki in Masamune, Short Fl. Form. 125. 1936.

*Ilex mutchagara* Makino var. *kanehirai* (Yamamoto) Masamune in Trans. Nat. Hist. Soc. Form. **25**: 253. 1935. — Kanehira & Hatusima in Trans. Nat. Hist. Soc. Form. **29**: 156. 1939. — Sonohara et al., Fl. Okinawa 92. 1952.

Regarding the status of this taxon, there is considerable controversy among botanists. Yamamoto first placed it as a variety of *Ilex crenata* Thunb. Koidzumi in 1929 raised it to specific rank, and both Kanehira and Sasaki agreed with him. Masamune maintained it as a variety of *Ilex mutchagara* Makino. Kanehira also adopted this concept. *Ilex mutchagara* Makino is characterized by oblanceolate leaves with a shortly acuminate apex and solitary fruits. The present species has fasciculate fruits and obovate leaves with rounded apex. Its relationship should be closer to *Ilex triflora* Blume, a species with fasciculate fruits, which is widely spread in China.

This variety was first described from Giran in northeastern Taiwan. Additional material has since been collected from Kosyun at the southern extremity of the island. It also occurs on the island of Hainan and in Fukien Province of the Chinese mainland.

14. **Ilex integra** Thunb., Fl. Jap. 77. 1784. — Sieb. & Zucc. in Abh. Bay. Ak. Wiss. Math. Phys. **4** (2): 148 (Fl. Jap. **1**: 40). 1845. — Maxim. in Mém. Acad. Sci. St. Pétersb. VII, **29** (3): 28, 41, *pl. 1, fig. 3*. 1881. — Forbes & Hemsl. in Jour. Linn. Soc. Bot. **23**: 116. 1886. — Ito & Matsum. in Jour. Coll. Sci. Univ. Tokyo **12**: 368. 1900. — Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 270 (Monog. Aquif. **1**: 270). 1901. — Matsum. & Hayata, Enum. Pl. Form. 82. 1906. — Sasaki, Cat. Gov. Herb. Form. 317. 1930. — Suzuki in Masamune, Short Fl. Form. 125. 1936. — Rehder, Man. Cult. Trees and Shrubs,

ed. 2, 548. 1940; Bibliogr. Cult. Trees and Shrubs 400. 1949. — Sonohara et al., Fl. Okinawa 92. 1952.

*Othera japonica* Thunb. (praes., resp. Lodin), Nov. Gen. Pl. 56. 1783.

*Ilex othera* Sprengel, Syst. Veg. 1: 496. 1826.

*Ilex asiatica* Sprengel, l.c.

*Prinos integra* Hook. & Arn. in Bot. Beechey Voy. 261. 1853.

Small evergreen trees 5–8 m. high, the trunk 12–20 cm. in diameter, glabrous; branchlets subterete, striate, the third year's growth 3–4 mm. in diameter, the lenticels lacking, the leaf-scars suborbicular, conspicuous, the current year's growth 2–3 mm. in diameter, the terminal buds well developed, conic, glabrous. Leaves occurring also on second year's growth, 3–15 mm. apart, the stipules obscure; petioles 1–1.5 cm. long, up to one third the length of the lamina, narrowly canaliculate above; lamina coriaceous, olivaceous and brunneous, obovate to obovate-elliptic, rarely oblanceolate, 4–7 cm. long, 1.5–2.5 cm. wide, cuneate, rarely obtuse at the base, abruptly short-acuminate, the acumen 5 mm. long, entire, the midrib plane above, evident beneath, the lateral nerves 6–9 pairs, obscure, rarely evident on both surfaces. Inflorescence fasciculate, the flowers 4-merous, the individual branches of the fascicles uniflorous. Staminate inflorescence: pedicels 4–5 mm. long, glabrous, bracts ovate, glabrous, ciliate, the prophylla basal, ciliate; calyx patelliform, 4 mm. across, the lobes ovate, 1.75 mm. long, obtuse and ciliate; corolla rotate, 10–11 mm. across, the petals oblong, 5 mm. long, 2 mm. wide, connate at the base; stamens shorter than the petals, the anthers oblong; rudimentary ovary globose, slightly depressed, often 4-lobed at the apex. Pistillate inflorescence: pedicels 6–8 mm. long, bracts ovate, the prophylla 2, basal, ciliate; calyx patelliform, 3 mm. across, the lobes rounded; corolla erect, the petals obovate, 5 mm. long, 3.5 mm. wide, the apex rounded, ciliate; staminodes shorter than the petals, the sterile anthers minute, cordate; ovary ovoid, 4 mm. long, 3.5 mm. wide, the apex flat with discoid stigma. Fruit large, globose or oblong-ellipsoid, 9–19 mm. long, 10 mm. in diameter, the exocarp thick, the stigma discoid. Pyrenes rugose, striate and sulcate, the back oblong in outline, 7–10 mm. long, 4 mm. wide, slightly depressed along the middle, the endocarp stony.

LIUKIU ISLANDS: Okinawa, Kunigami, *E. H. Walker, S. Sonohara, S. Tawada & T. Amano 7005*; same locality, *S. Sonohara, S. Tawada & T. Amano 6309*. Nakano-shima, Linshoten Isl. Group, *S. Kawagoe*, Aug. 20, 1912.

JAPAN: Hondo: Tokyo, *E. Elliott 7*; *M. Mizushima 1088*. Sagami, *M.* & *U. Mizushima 911*; *K. Miyabe*, April 1882; *K. Sakurai*, April 12, 1906. Mino, *K. Shiota 70, 6542*. Yokohama, *Maximowicz* in 1862 (G); *E. H. Wilson 6415*. Kamakura, *E. H. Wilson 6608, 6609*. Nagasaki, *Oldham*. Without precise locality, Herb. Thunberg, fragment of type material; *Siebold* ex Herb. Lugduno-Batavo 101570 (A, G); *Zollinger*. Kyushu: Tanega-shima, *E. H. Wilson 6134*. Kago-shima, *E. H. Wilson 6167*.

KOREA: Quelpaert, *U. Faurie 1638, 1639, 1647*; *T. Taquet 622, 623, 2718, 2719, 4146*; *E. H. Wilson 9513*. Oo-ryong-too, *E. H. Wilson 8540*. Port Hamilton, *C. Wilford* in 1859 (G).

I have also examined material cultivated in Japan, the Royal Botanic Gardens at Kew, the Golden Gate Park, San Francisco, and in gardens in Augusta, Ga., and Federal Point, Fla. In Japan the tree is widely cultivated for ornamental purposes. The young leaves are eaten as greens. The bark is ground to obtain a sticky substance which is used for bird-lime. Loesener recorded this species from China, as represented by *Fortune 57*. Among all the Chinese material of *Ilex* that I have examined, there is no element that is close to this species, and it appears that any occurrence of it in China is not spontaneous.

There exists a great variation in leaf-shape and pedicel-length. The pedicels of all the Liukiu material that I have examined are on the short end of the normal curve. They are 6–7 mm. long. Among the Japanese and Korean elements there is a long-pedicellate form. The fruiting pedicels are as long as 10–15 mm. In such cases the prophylla are inserted on the pedicels, about one third of the way from the base.

15. **Ilex brachypoda** sp. nov.

Frutex sempervirens, usque 3 m. altus, ramulis glaberrimis, bienniis 4 mm. diametro, teretis, rugosis, lenticellis obsoletis; foliis coriaceis, integerrimis, obovatis, vel oblongo-obovatis, 3–8 cm. longis, 1.5–4.5 cm. latis, basi acutis vel cuneatis, apice obtusis vel breviter acuminatis, costa supra plana, subtus prominula, nervis lateralibus utrinque 5 vel 6, obscuris; inflorescentiis paucifasciculatis, floribus 4-meris; ♂ ignotis; ♀ unifloris, pedicellis 2–3 mm. longis, prophyllis basalibus, ciliatis; calycibus patelliformibus, 4 mm. diametro, lobis ciliatis; corolla erecto-patenti, petalis liberis, ovatis, 4 mm. longis, 3 mm. latis; staminodiis petalis brevioribus, antheris parvis, cordiformibus, ovario magno, ovoideo, 4–5 mm. longo, 3–4 mm. diametro, stigmate discoideo. Fructus globosus, 10 mm. diametro, stigmate umbilicato; pyrenis 4, rugosis et lapidosis, dorso 8 mm. longis et 4 mm. latis, leviter depressis.

LIUKIU ISLANDS: Okinawa, Genka, Mt. Kunchon, *E. H. Wilson 8118*. Oosima, *C. Wright*, US 15798 (US, TYPE).

According to Wilson this is a common shrub in Okinawa. Its white flowers appear in early March. It is closely related to *Ilex integra* Thunb., from which it can be distinguished at once by its subsessile fruits.

16. **Ilex bioritsensis** Hayata in Jour. Coll. Sci. Univ. Tokyo **30**: 53. 1911. — Sasaki, Cat. Gov. Herb. 316. 1930. — Suzuki in Masamune, Short Fl. Form. 124. 1936. — S. Y. Hu in Jour. Arnold Arb. **30**: 366. 1949.

This species is characterized by its small spinose leaves and paired fruits, each with two pyrenes. It was first recorded from Bioritsu [Byoritu], on Mt. Tokuzyo-taizan. Additional material has been collected from Tonbara of Nanto in Taichu prefecture and Mt. Noko of Taito prefecture. It is

now also known from central and western China in mixed forests at altitudes of 1700–3960 meters. In Taiwan it grows to be a small tree up to seven meters high. As a result of repeated cutting for firewood, it is often seen as a shrub about two meters high. Its compact shiny evergreen foliage and its brilliant red fruits make it a good garden specimen.

17. **Ilex dimorphophylla** Koidzumi, Pl. Nov. Amami-Ohsim. 12. 1928.

An evergreen shrub, the old twigs light gray, slightly rugose, the current year's growth pilose. Leaves occurring also on the third year's growth, 4–12 mm. apart, the petioles 0.5–3 mm. long, canaliculate and puberulous above; lamina coriaceous, olivaceous, glabrous, entire or on young shoots 3- to 6-sinuate-dentate on each side, spiny, obovate, obovate-elliptic or broad-elliptic, 1–3.5 cm. long, 7–17 mm. wide, obtuse or rounded at the base, mucronulate-acute to rounded at the apex, the midrib plane above, slightly elevated beneath, the lateral nerves 4 or 5 pairs, obscure on both surfaces. Flowers not known. Infructescence fasciculate, axillary on the second year's growth; pedicels 5 mm. long, puberulous, the prophylla 2, basal, ovate, ciliate; young fruit globose, 3 mm. in diameter, 4-loculate, the stigma 4-lobed discoid, the persistent calyx 2.5 mm. across, 4-lobed, the lobes ovate, rounded at the apex, ciliate. Pyrenes not known.

LIUKIU ISLANDS: Amami-Oshima: Mt. Yuwandake, *S. Tashiro* in March 1924 (Herb. Univ. Kyoto, LECTOTYPE, photograph and fragment in A); same locality, *G. Koidzumi* in April 1923 (Herb. Univ. Kyoto, PARATYPE; photograph and fragment in A).

When Koidzumi published this species, he cited three specimens (*Z. Tashiro* in 1924, *H. Ohba* in 1925, and *G. Koidzumi* in 1923), not designating the type. Tashiro's collection represents a four-year-old shoot. The leaves are elliptic, all spiny, and with extremely short petioles. Its appearance reminds one of the Taiwan species *Ilex bioritsensis* Hayata. Koidzumi's collection is a fruiting specimen. Its leaves are all entire and the petioles are 3 mm. long. It resembles a Hongkong species, *Ilex championii* Loes. As leaf-dimorphism is a common feature in many species of *Ilex* (as in the case of *Ilex cornuta* Lindl., where both spiny and entire leaves occur on the same plant), I think that Koidzumi was probably justified in maintaining these heterogeneous elements with entirely different aspects as conspecific. Regarding the typification of this species Dr. S. Kitamura of the Botanical Institute of Kyoto wrote, "I selected the specimens collected by S. Tashiro as the lectotypus. This specimen is sterile. There is Koidzumi's handwriting . . . greater part of his original description coincides well with this specimen. I selected the specimen collected by G. Koidzumi as paratypus."

This species appears to be close to *Ilex goshiensis* Hayata, which has abruptly short-acuminate, retuse, entire leaves 2.8–4.8 cm. long and 1.5–2.5 cm. wide.

18. **Ilex suzukii** S. Y. Hu in Jour. Arnold Arb. **30**: 376. 1949.

TAIWAN: Mt. Taiheizan, *S. Suzuki*, Aug. 7, 1928 (US).

This species is endemic to Mt. Taiheizan, Taihoku, Taiwan. It has a superficial resemblance to *Ilex goshiensis* Hayata because both species have small entire leaves. But the nerves on the leaves of Hayata's species are obscure beneath, the fruits have thick discoid stigmata, and the endocarps of the pyrenes are coriaceous, while the leaves of this species are prominently reticulate beneath, the stigmata of the fruits are navel-like, and the endocarps of the pyrenes are woody. According to the characters presented in the fruit and pyrenes, this species should be placed in Series *Denticulatae* S. Y. Hu of the Section *Aquifolium* Gray. But all the other species in this series have denticulate leaves, while this one has entire ones. More material is awaited for the clarification of its taxonomic position.

19. **Ilex formosana** Maxim in Mém. Acad. Sci. St. Pétersb. VII **29** (3): 46. 1881. — Henry in Trans. As. Soc. Jap. **24** (Suppl.): 27 (List Pl. Form. 27). 1896. — Matsum. & Hayata, Enum. Pl. Form. 81. 1906. — Hayata in Jour. Coll. Sci. Univ. Tokyo **30**: 54 (Mat. Fl. Form. 54). 1911, et in Ic. Pl. Form. **1**: 131. 1911. — Sasaki, Cat. Gov. Herb. 316. 1930. — Suzuki in Masamune, Short Fl. Form. 125. 1936. — S. Y. Hu in Jour. Arnold Arb. **31**: 68. 1950.

This species was based on material collected by Oldham in Taiwan. It has been considered endemic to that island by some botanists, among them Kanehira. The type material has elliptic-lanceolate leaves with obscure reticulation on the lower surface and an acuminate apex, and small fruits on very short (2–3 mm. long) pedicels. As our knowledge of the flora of mainland China increases, we know that a species so characterized is widespread in the warmer regions of China. In Taiwan it occurs in forests at altitudes of 600–700 meters, where it grows to a tree up to twelve meters high. The red fruits remain on the tree throughout the winter, from December to March.

20. **Ilex ficoidea** Hemsl. in Jour. Linn. Soc. Bot. **23**: 116. 1886. — S. Y. Hu in Jour. Arnold Arb. **31**: 72. 1950.

*Ilex buergeri* Miq. var. *glabra* Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **89**: 286 (Monog. Aquif. **2**: 286). 1908.

*Ilex glomeratiflora* Hayata, Ic. Pl. Form. **3**: 53. 1911; **5**: 15, *fig. 6*. 1915, et **6** (Suppl.): 13 (Gen. Ind. Fl. Form. 13). 1917. — Yamamoto, Suppl. Ic. Pl. Form. **1**: 32. 1925, pro parte. — Sasaki, Cat. Gov. Herb. 316. 1930. — Suzuki in Masamune Short Fl. Form. 125. 1936.

*Ilex arisanensis* Yamamoto Suppl. Ic. Pl. Form. **1**: 30, fig. *10*. 1925. — Sasaki, Cat. Gov. Herb. 316. 1930. — Kanehira, Form. Trees, rev. ed. 370. 1936. — Suzuki in Masamune, Short Fl. Form. 124. 1936.

*Ilex warburgii* sensu Yamamoto, Suppl. Ic. Pl. Form. **1**: 40. 1925, non Loes., 1901.

*Ilex buergeri* Miq. var. *glabra* Loes. was based on *Faurie 39* from Taiwan. In the herbarium of the Arnold Arboretum there are two sheets of this number. Their glabrous stems, caudate leaves, and very short fruiting pedicels are characteristic of *Ilex ficoidea* Hemsl. In making this variety a synonym of *Ilex warburgii*, Yamamoto misinterpreted the latter species.

The type of *Ilex glomeratiflora* Hayata represents a staminate plant of *Ilex ficoidea* Hemsl., which has very short pedicels, 1.5 mm. long. Yamamoto wrongly identified the long pedicellate fruiting material of *Ilex uraiensis* Yamamoto as the female plant of *I. glomeratiflora*, and at the same time determined *U. Faurie 186* as *Ilex arisanensis*. This last taxon represents a plant with short fruiting pedicels. Both Sasaki's and Faurie's collections were from Arisan. They represent the staminate and pistillate plants of the same species, *Ilex ficoidea* Hemsl.

21. **Ilex liukiuensis** Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 336 (Monog. Aquif. **1**: 336). 1901. — Sasaki, Cat. Gov. Herb. 317. 1930. — Masamune & Suzuki in Ann. Rep. Taihoku Bot. Gard. **3**: 61. 1933. — Sonohara et al., Fl. Okinawa 92. 1952.

*Ilex mertensii* sensu Ito & Matsum. in Jour. Coll. Sci. Univ. Tokyo **12**: 369 (Tent. Flor. Lutch. 369). 1900. — sensu Sonohara et al., Fl. Okinawa 92. 1952, non Maxim., 1888.

Evergreen trees up to 8 m. high, entirely glabrous; branchlets of the third year's growth 3 mm. in diameter, rugose with large, slightly elevated leaf-scars and scars of the inflorescences, the lenticels lacking, the current year's growth 1.7 mm. in diameter, striate. Leaves occurring also on the third year's growth, 3–10 mm. apart, the stipules minute, often obsolete; petioles 10–16 mm. long, up to one third the length of the lamina, narrowly canaliculate above; lamina coriaceous, brunneous, rarely olivaceo-brunneous, obovate, or oblong-elliptic, those near the apex sometimes elliptic, 3–7.5 cm. long, 1.8–3.5 cm. wide, acute at the base, obtuse, rounded, retuse or broadly short-acuminate at the apex, the margin recurved and obviously thickened, subentire or remotely crenulate, the midrib plane above, elevated beneath, the lateral nerves 5 or 6, obscure above, prominent and noticeably reticulate beneath. Staminate inflorescence unknown. Pistillate inflorescence fasciculate, 2–4-flowered, the pedicels 9–14 mm. long, each with two prophylla inserted 1–2 mm. above the base; calyx patelliform, 2 mm. across, 4- or 5-lobed, the lobes rounded, ciliate; corolla rotate, 8 mm. across, the petals more or less free, oblong, 3.5 mm. long, ciliate at the apex; staminodes half the length of the petals, the anthers sagittate, ovary ovoid, 1.5 mm. long, the stigma discoid. Fruit globose, 6 mm. in diameter, the persistent calyx explanate, the stigma navel-like, 4-lobed. Pyrenes 4, the back oblong in outline, 4.5 mm. long, 3 mm. wide, the middle longitudinally depressed, rugose and obliquely striate, the endocarp woody.

LIUKIU ISLANDS: Iriomotto [Iriomote], *Warburg* in 1887 (fragment of the TYPE, A); same island, between Shira-hama and Sonai, *E. H. Walker & S.*

*Tawada 6528.* Ishigaki Island, *E. H. Walker & S. Tawada 727.* Okinawa, Nago-Dake, *T. Kanashiro 1697* (US), *1812.*

I have also seen some sterile material from Yokohama Nursery.

The woody, rugose, dorsally impressed pyrenes, the relatively long-petiolate, obovate or oblong-elliptic leaves, the fasciculate fruit, and the absence of lenticels on the third year's growth of *Ilex liukiuensis* all suggest a close relation with *I. graciliflora* Champ. of Hongkong. Besides the geographical separation, the latter species differs in having sparsely puberulous branchlets, pedicels 4–6 mm. long, and thickly coriaceous leaves.

In Liukiu the plant occurs on forest ridges. The fruit begins to turn red in middle August.

22. **Ilex uraiensis** Yamamoto in Jour. Soc. Trop. Agr. Taiwan **4**: 486. 1932. — Suzuki in Masamune, Short Fl. Form. 126. 1936. — S. Y. Hu in Jour. Arnold Arb. **30**: 382. 1949.

*Ilex mutchagara* sensu Sasaki, Cat. Gov. Herb. 318. 1930. — sensu Kanehira, Form. Trees, rev. ed. 378, *fig. 335.* 1936, non Makino, 1913.

*Ilex uraiana* Hayata in sched. ex Kanehira, l.c., in syn.

*Ilex kelungensis* sensu Kanehira & Hatusima in Trans. Nat. Hist. Soc. Form. **29**: 156. 1939, non Loes. 1901.

TAIWAN: without precise locality, *W. R. Price 262* (fragment).

*Ilex uraiensis* Yamamoto was based on material collected from Uraisha and Sozan of northern Taiwan, with the type from Sozan. This material was interpreted as *Ilex mutchagara* by Sasaki, as indicated by his citations, in 1930, and by Kanehira in 1936. As Kanehira was the Director of the Department of Forestry, Government Research Institute, and Sasaki the Curator of the Herbarium of the same department, it was natural for them to base their misinterpretation on the same material of *I. mutchagara* Makino. Sasaki cited no synonyms. Kanehira overlooked Yamamoto's publication and credited the binomial to Hayata as *Ilex uraiana* Hayata in sched. Both Kanehira and Sasaki were mistaken in maintaining that the Uraisha and the Sozan specimens were conspecific with the Liukiu *I. mutchagara* Makino. Kanehira's illustration, based on northern Taiwan material, was certainly not Makino's Liukiu species. In the Arnold Arboretum we have several collections with both flowering and fruiting specimens from Sozan, the type locality of *Ilex uraiensis* Yamamoto. *Wilson 10288,* a staminate plant in full bloom, matches Kanehira's figure in every respect. The leaves of this specimen appear similar in size and shape to those of *I. mutchagara* Makino. But the lower surface of Makino's species is "brownish-puncticulate" and that of the Sozan material is not. Moreover, the endocarp of the pyrenes of the Liukiu species is "smooth, thin, coriaceous," while that of the Sozan species is "irregularly striate, wrinkled . . . and stony." The punctate leaves, black fruits, and smooth coriaceous endocarps of *Ilex mutchagara* Makino place it in the section *Paltoria,* while the crenulate-serrate leaves, the fasciculate red fruits and the irregularly striate,

wrinkled and stony endocarps of *Ilex uraiensis* Yamamoto place it in the *Denticulatae* series of the section *Aquifolium*. The resemblance in size and shape of the leaves in these two species is very superficial.

Again, in 1939, Kanehira and Hatusima interpreted *Ilex uraiensis* Yamamoto as conspecific with *Ilex kelungensis* Loes. The latter species was based on Warburg's collection made in November 1895 at Kelung, a port in the northeastern part of Taihoku. Its elliptic-lanceolate leaves with obscure reticulate veinlets on the lower leaf-surface, and the small fruits on very short pedicels (2–3 mm. long), are characteristic of *Ilex formosana* Maxim., to which it belongs. *Ilex uraiensis* Yamamoto, on the other hand, is characterized by its prominently reticulated leaves and larger fruits on pedicels 6–8 mm. long. The size and shape of the smaller leaves of this species appear to resemble those of the isotype of *Ilex kelungensis* Loes., which I interpret to be conspecific with *I. formosana* Maxim. It was probably on account of this superficial resemblance that Kanehira and Hatusima made *I. uraiensis* Yamamoto a synonym of *I. kelungensis* Loes.

22a. **Ilex uraiensis** Yamamoto var. **formosae** (Loes.) S. Y. Hu in Jour. Arnold Arb. **30**: 383. 1949.

This variety differs from the typical *Ilex uraiensis* Yamamoto in its smaller obovate leaves with rounded or obtuse apex.

22b. **Ilex uraiensis** Yamamoto var. **macrophylla** var. nov.

Frutex, ramulis glabris; foliis coriaceis, ellipticis, raro obovato-ellipticis, 7–10.5 cm. longis, 3.5 cm. latis, basi acutis, apice brevi-acuminatis, acumine 5–10 mm. longis; fructibus fasciculatis, pedicellis 6–8 mm. longis.

TAIWAN: Kiirun, *T. Tanaka & Y. Shimada 17797* (TYPE).

This large-leaved variety differs from the typical *Ilex uraiensis* Yamamoto in which the elliptic or obovate-elliptic leaves measure only 3–7 cm. long and 1.5–2.5 cm. wide.

23. **Ilex warburgii** Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 326 (Monog. Aquifol. **1**: 326). 1901. — Yamamoto, Suppl. Ic. Pl. Form. **1**: 40. 1925. — Suzuki in Masamune, Short Fl. Form. 126. 1936.

A small evergreen tree up to 4 m. high; branchlets glabrous, the third year's growth 3–4.5 mm. in diameter, the lenticels obscure, the leaf-scars suborbicular, the current year's growth 1.5–2 mm. in diameter, subterete, the terminal buds conic, pubescent. Leaves 1–2 cm. apart, occurring also on the second year's growth, the stipules obscure, the petioles 8–15 mm. long, up to one fifth the length of the lamina, deeply canaliculate, minutely puberulent or glabrescent above; lamina coriaceous, olivaceous, oblong-elliptic, rarely broad elliptic, 4–8.5 cm. long, 2.4 cm. wide, obtuse or rounded at the base, abruptly caudate at the apex, the acumen 8–15 mm. long, 2–3 mm. wide, the width rather uniform, remotely crenulate-serrate, the midrib

impressed above, glabrous or very minutely puberulent, elevated beneath, the lateral nerves 7 to 9 pairs, obscure above, evident beneath, reticulate near the margin. Flowers not known. Infructescence fasciculate or subracemose, the central axis up to 6 mm. long, the pedicels of individual fruits 4–8 mm. long, the prophylla basal or medium, the fruit globose, 5–6 mm. in diameter, the persistent calyx explanate, 2 mm. across, the lobes ciliate, the stigma navel-like. Pyrenes 4, short and robust, rugose, striate and sulcate, the back ovate in outline, 4 mm. long, 3 mm. wide, the endocarp woody.

TAIWAN: Taihoku, Shirin, Taihoku Univ. Herb. no. 11132; Shirin to Sozan, *E. H. Wilson 10298.*

LIUKIU ISLANDS: Ischigaki (Ishigaki), *Warburg* (fragment of TYPE). Yaeyama Gunto, Iriomote, *E. H. Walker & S. Tawada 6665.*

This species is closely related to *Ilex ficoidea* Hemsl., which is characterized by its very short (2–3 mm. long) fruiting pedicels.

24. **Ilex pubescens** Hook. & Arn., Bot. Beechey Voy. 167, *pl. 35.* 1833. — Yamamoto, Suppl. Ic. Pl. Form. 1: 39. 1925. — Sasaki, Cat. Gov. Herb. 318. 1930. — S. Suzuki in Ann. Rep. Taihoku Bot. Gard. 1: 154. 1931, et in Masamune, Short Fl. Form. 125. 1936. — S. Y. Hu in Jour. Arnold Arb. 31: 220. 1950.

TAIWAN: between Goshyo & Suizya, *S. Suzuki 5799*; Taihokuzyu, Bunzan-gun, *Suzuki-Tokio 8822*; same locality, *S. Suzuki* on April 30, 1933. Baran, *Kudo-Sasaki 15126.*

This species was first published on the basis of material collected from Hongkong. It has a wide range of distribution on the mainland of China, from Chekiang and Anhwei southward to Kwangtung and Kwangsi. In Taiwan it has been reported from Sozan, Heirinbi, Taihei, and Urai in the northern part of the island, from Nanto and Lake Candidius in the central part of the island, and from Kosyun and South Cape at the southern extremity of the island. It is a common shrub in thickets along the roadside at altitudes 600–750 meters. Its pinkish flowers appear in late March and its scarlet fruit lasts on the bush all through the winter.

25. **Ilex cochinchinensis** (Lour.) Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 230 (Monog. Aquif. 1: 230). 1901. — S. Y. Hu in Jour. Arnold Arb. 31: 239. 1950.

*Ilex ardisioides* Loes. op. cit. 359. 1901. — Sasaki, Cat. Gov. Herb. 316. 1930. — Suzuki in Masamune, Short Fl. Form. 124. 1936.

In Taiwan this species occurs only at the southern extremity of the island. It is found also in Hainan and northern Indo-China. Its large entire punctate leaves and its fasciculate fruits are very characteristic. In commenting on *Ilex ardisioides* Loes., Hayata wrote in 1911, "a species imperfectly known to me." Two years later he published *Ilex cleyeroides*, which is a synonym of *Ilex cochinchinensis* (Lour.) Loes.

26. **Ilex goshiensis** Hayata in Jour. Coll. Sci. Univ. Tokyo **30**: 54 (Mat. Fl. Form. 54). 1911, et Ic. Pl. Form. **1**: 131. 1911. — S. Y. Hu in Jour. Arnold Arb. **31**: 248. 1950.

*Ilex hanceana* sensu Ito & Matsum. in Jour. Coll. Sci. Univ. Tokyo **12**: 367 (Tent. Fl. Lutch. 367). 1900. — sensu Hayata, Ic. Pl. Form. **6** (Suppl.): 13 (Gen. Ind. Fl. Form. 13). 1917. — sensu Sasaki, Cat. Gov. Herb. 317. 1930. — sensu Sonohara et al., Fl. Okinawa 92. 1952, non Maxim., 1881.

LIUKIU ISLANDS: Okinawa, *T. Miyagi* (fragment); Kunigami, Tanyu-dak, *S. Sonohara, S. Tawada & T. Amamo 6308*; Genka Mt., *E. H. Wilson 8091* (A, US).

JAPAN: Kyushu: Hingo, Koonose, *K. Mayebara 320* (fragment); Mt. Kirshima, *Z. Tashiro*, May 8, 1913 (sterile).

This species has been misinterpreted as *Ilex hanceana* Maxim. by many botanists. Through Dr. H. Hara of the Botanical Institute, University of Tokyo, I have obtained fragments of the type material for comparison, accompanied by an excellent photograph. The elongated pedicels, the fasciculate umbelliform inflorescences, with the individual branches 3- to 7-flowered, and the globose fruit with slightly elevated discoid stigmata, are distinct features of this species. It is very different from *Ilex hanceana* Maxim., which has paired fruits on very short (1.5 mm. long) pedicels.

In Taiwan and Liukiu this species appears to be a small tree up to 6 meters high. It is common at altitudes of 100–600 meters. Its fruit turns red in August (fide Gressitt) and remains dull red until March (fide Wilson).

27. **Ilex hayataiana** Loes. in Fedde Rep. Spec. Nov. **55**: 333. 1941. — S. Y. Hu in Jour. Arnold Arb. **31**: 249. 1950.

LIUKIU ISLANDS: Okinawa: Yona, *J. W. Conover 1139, 1840* (US); Kunigami, Nago-dake, *E. H. Walker, S. Sonohara, S. T. Tawada & T. Amano 6192*. Irumuti (Iriomote), *S. Murayama* in 1927.

This species differs from *Ilex goshiensis* Hayata in having narrower leaves with acuminate or caudate apex and fasciculate uniflorous individual branches in the inflorescences. It has been reported to be abundant at altitudes of 230–330 meters, where it grows as a small tree along the banks of streams in the shade of taller trees or steep walls of the valleys.

## DOUBTFUL AND EXCLUDED SPECIES

ILEX CINEREA sensu Ito & Matsumura in Jour. Coll. Sci. Univ. Tokyo **12**: 369 (Tent. Fl. Lutch. 369). 1900. — Sonohara et al., Fl. Okin. 92. 1952, non Champ., 1852.

*Ilex cinerea* Champ. ex Benth. is endemic to Hongkong. Its large oblanceolate leaves with very short (2–4 mm. long) petioles and its very short (2–3 mm. long) pedicellate fruits are very characteristic. Many East Asian specimens belonging to *Ilex ficoidea* Hemsl. or *I. formosana* Maxim.

have been erroneously named *Ilex cinerea* Champ. It is quite likely that authors dealing with the flora of the Liukius may have made similar errors, since I have no evidence, from the material which I have examined, to lead me to believe that the species has ever been collected outside Hongkong.

ILEX MATANOANA sensu Sasaki, Cat. Gov. Herb. 317. 1930. — sensu Masamune & Suzuki in Ann. Rep. Taih. Bot. Gard. 3: 61. 1933, non Makino, 1913.

*Ilex matanoana* Makino was first published from the Bonin Islands. Its small coriaceous obovate leaves with retuse apex and prominently reticulate nerves are very characteristic. Judging from the material I have studied, the species of *Ilex* in the Bonin Islands are very different from those of Taiwan and the Liukiu Islands. In fact, there is no Bonin Island element of *Ilex* found in the flora of Taiwan and Liukiu. Sasaki ascribed specimens collected from Sozan, Giran, and Kosyun to this species. Masamune & Suzuki recorded it as occurring on Kizan, a small volcanic island northeast of Taiwan. They cited no specimens. As these collections are not available for my examination, I can only question their interpretation.

*Ilex nokoensis* Hayata in Jour. Coll. Sci. Univ. Tokyo 30: 56 (Mat. Fl. Form. 56). 1911, et in Ic. Pl. Form. 1: 133. 1911. — Kanehira, Form. Trees, 1st ed. 125. 1917 = **Symplocos nokoensis** (Hayata) Kanehira, Anat. Charact. Ident. Form. Woods 151. 1921, et Form. Trees, rev. ed. 596, *fig. 553*. 1936.

ILEX EURYAEFOLIA Mori & Yamamoto in Jour. Soc. Trop. Agr. Form. 4: 485. 1932.

This species was based on *T. Suzuki 7332*, collected from Mt. Taihei in the northeastern part of Taiwan. According to the description of the authors, the plant has "Folia coriacea . . . longe eliptica vel oblongo-oblanceolata vel subspathulata . . . apice [obtusa], . . . margine ad totam crenato-serrata sed raro inferne integra . . . petiolis brevibus 3–5 mm. longis . . . Inflorescentia fructifera axillaris, umbellaeforme fasciculata . . . Fructus globosi, 4 mm. in diametro, apice stigmate rostrati . . . pyrenis 4."

ILEX RARASANENSIS Sasaki in Trans. Nat. Hist. Soc. Form. 21: 154. 1931.

This species was based on Sasaki's own collection from Mr. Rarasan of Taihoku prefecture. According to his description the plant has "Leaves sempervirens, alternate and fascicules near the top of the branches . . . elliptic or ovate, entire or loose serrate . . . acuminate or caudate . . . Inflorescens [sic] umbellate panicles, terminal axilis [sic] of the branches, peduncles umbell [sic] . . . Drupe . . . 6 mm. in diameter, shining chestnut colour when ripe. Seed [sic] 6 . . . 3–4 mm. long, 2 mm. in diameter."

Kanehira in 1936, without giving any reason, excluded *I. rarasanensis* Sasaki and *I. euryaefolia* Mori & Yamamoto from the Aquifoliaceae in his Formosan Trees. In order to ascertain the status of these taxa, I wrote to Professor W. F. Chu, Head of the Department of Forestry, National Taiwan University, asking him for the photographs and fragments of the type material of these species. He very kindly searched in the Herbarium of the Department of Botany of the same University and also in the Government Herbarium of the Department of Forestry, Government Research Institute, of which Sasaki was curator. Unfortunately no traces of these species could be found. For the present they have to be classified among the doubtful species.

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